

## Van Fraassen's Appreciated Anti-Realism

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### I. Introduction

In his seminal work, The Scientific Image (1980), Bas van Fraassen formulates a distinct view of what science is - one that has, for the most part, fit relatively easily into the traditional scientific realism debate. This position, called *constructive empiricism*, is (simply put) the view that, "Science aims to give us theories which are empirically adequate and acceptance of a theory involves as belief only that it is empirically adequate" (van Fraassen [1980], 12). Van Fraassen intended this position to be an anti-realist position because, according to it, there is no need to believe these theories are true and no need to believe that the entities they postulate are real. According to the CE view of science, our good scientific theories are good because they are empirically adequate, and for that reason only.

Despite van Fraassen's intentions, some philosophers have disputed the authenticity of constructive empiricism's anti-realism. In particular, Ernan McMullin's recent paper *Van Fraassen's Unappreciated Realism* (2003) concludes, "What is not often noticed about Bas van Fraassen's distinctive approach to the scientific realism issue is that constructive empiricism, as he defines it, seems to involve a distinctively realist stance in regard to large parts of natural science" (McMullin, 455). In this paper, I examine McMullin's argument and suggest that to whatever extent he attempts to place van Fraassen in the scientific realist camp, it seems to be problematic. In order to argue for this, I outline McMullin's main argument and take issue with certain of its premises. More specifically, I conclude that even if McMullin can show that the constructive empiricist is a kind of *realist* about (what McMullin calls) O-theories, this should not be understood as amounting to *scientific realism*.

### 2. McMullin's Argument

In this section, I examine the implicit argument that McMullin makes in his paper for the conclusion that constructive empiricism (CE) is a scientific realist position about much of the natural sciences. In sections (3) and (4) of this paper, I take issue with certain of the

argument's premises in order to conclude (in section (5) that van Fraassen ought not to be understood as any kind of scientific realist.

McMullin's argument for the conclusion that CE is a kind of scientific realism (SR) about much of the natural sciences can be stated in terms of two premises and a conclusion.

- (1) CE is a realist position about O-theories
- (2) Realism about O-theories amounts to scientific realism about much of the natural sciences
- (3) Therefore, CE is a scientific realist stance about much of the natural sciences

McMullin does not outline his argument in this form. I have attempted to simplify his prosaic style into this syllogistic form for the purpose of clarity and argumentation. This formulation of McMullin's argument requires explanation and justification on my part. In order to do this, I show textual support for both of the premises and demonstrate that the conclusion logically follows.

As for premise (1), I claim that McMullin clearly identifies CE as a realist position about (what he calls) *O-theories*. What are O-theories? And does McMullin think van Fraassen is a realist about them? In order to make this clear, I first need to refer to the famous (or infamous) observable/unobservable distinction postulated by van Fraassen himself in his formulation of CE.<sup>1</sup> For a theoretical entity X, "X is observable if there are circumstances which are such that if X is present to us under those circumstances, then we observe it;" a theoretical entity is unobservable if there are no such conditions (van Fraassen [1980], 16). This distinction, as we will see, is the means by which McMullin attempts to distinguish his two types of theories. McMullin writes, "According to constructive empiricist tenets, there are, effectively, two different sorts of theory, according as to whether the theoretical entities postulated by the theory themselves are observable or not" (McMullin, 460). In his section called *Two Sorts of Theories: a Historical Note*, McMullin digresses into some history of science spanning from the ancient Greeks to contemporary astrophysics in order to provide context for

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<sup>1</sup> The grounds of this distinction are the subject of a myriad of literature in the philosophy of science (Alspector-Kelly, Ladyman, Monton, Hanna). However, the nature of this distinction itself shall not be the subject of this paper.

(what he takes to be) a possible distinction: theories which postulate only observable entities (O-theories) and theories which include the postulation of entities that are unobservable (U-theories).

The key to showing McMullin's support for premise (1) above is to show that he thinks this: when the constructive empiricist deems a theory as *empirically adequate*, she is committing to the existence of whatever the theory says is true about the observable phenomena it postulates. McMullin writes, "To describe such a theory as 'empirically adequate', would be, in effect, to claim the existence – past present, and future – of the observable entities postulated by the theory" (McMullin, 462). This existential claim is enough to separate CE from those views in the philosophy of science that he calls global anti-realism. He writes,

To call an O-theory empirically adequate is to commit oneself, as we have seen, to holding that the theoretical entities postulated by the theory, the dinosaurs and the tectonic plates, actually exist or existed, for it would after all, be a consequence of such a theory that the entities it postulates could, in principle, be observed by us. And this existence-claim, as we also have seen, is sufficient to qualify this belief as a fully realist one. (McMullin, 464)

McMullin thinks that CE is a realist position about O-theories, where O-theories are those scientific theories which postulate only entities that are observable (premise (1)).

Let us turn to premise (2), McMullin equates realism about O-theories with scientific realism about much of the natural sciences. This can be understood by the fact that McMullin thinks that many of our natural sciences qualify as consisting only of O-theories. All of these natural sciences (that qualify as consisting of only O-theories) have a certain characteristic in common: they are "natural sciences of the distant" (McMullin 461). Astrophysics, geology, paleontology, archeology, physical anthropology and evolutionary biology (for example) are sciences that either postulate entities that are spatially distant or historically distant. But neither form of distance hinders observability for van Fraassen. "The theoretical entities in which these sciences terminate are, in large part, observable in his sense, i.e. observable, in principle, by human beings 'were they to be there'." (McMullin, 462).

In other words, McMullin wants to suggest that several natural scientific theories qualify as consisting only of O-theories because the entities they postulate (sun spots,

moon craters, primitive human culture, and dinosaurs) could have been observed by humans if the situation were such that they were able to be there to do the observing. To the extent that these natural sciences deal exclusively with observable phenomena, they consist only of O-theories. With regard to the natural sciences listed above (geology, paleontology, etc.), the constructive empiricist counts as being an all-out scientific realist. He writes, “To the extent that he admits the empirical adequacy of a theory, therefore, van Fraassen implicitly embraces scientific realism in its regard. This would presumably apply to a wide swath of the natural sciences where the aim of the scientist is assuredly to discover what happened in the past and just when and why it happened” (McMullin 465). In other words, McMullin claims that CE is a scientific realist theory about certain of these natural sciences, namely the ones that deal with discovering historical details or distant entities that count as observable. Therefore, premise (2).

In the previous paragraphs, I have attempted to show textual support for what I take to be McMullin’s central argument for van Fraassen’s unappreciated realism. If my formulation of this argument is correct, and I have shown that McMullin does support each premise, then the conclusion can be logically derived: (3) that McMullin thinks CE is SR about much of the natural sciences.

### 3. van Fraassen’s Realism

In this section, I examine the extent to which CE is a form of realism in order to evaluate and come to a (qualified) agreement with premise (1) of McMullin’s argument – that CE is (a kind of) realist position about O-theories. Though I do think CE may include a form of *local* realism regarding many scientific theories, I (in section IV) disagree with McMullin’s second premise (that this realism amounts to scientific realism about much of the natural sciences) and thereby dispute the soundness of his conclusion.<sup>2</sup>

There is an extent to which I very much agree with one of the central points of McMullin’s paper - that there is a marked difference between CE and global anti-realist philosophies of science. Global anti-realism either denies semantic or epistemic

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<sup>2</sup> I refer to *local realism* as the position that denies global anti-realism about at least one disciplined domain of discourse. This position has been referred to as *global realism* (Alspector-Kelly), but I find local realism a more apt characterization of CE, as we shall see, because I want to say that CE is anti-realist with regard to the scientific realism debate.

independence for every disciplined domain of discourse or it endorses global skepticism. CE does neither. In fact, CE overtly affirms at least one form of the semantic independence of scientific theories. Van Fraassen writes, “the language of science should be literally construed,” and “to insist on a literal construal of the language of science is to rule out the construal of a theory as a metaphor or simile” (van Fraassen [1980], 10-11). In this regard, CE is distanced from both instrumentalism and positivism which seem to regard scientific theories as ‘inference tickets’ to useful conclusions. In his recent response to McMullin, *On McMullin’s Appreciation of Realism Concerning the Sciences* (2003), van Fraassen eloquently explains some of his reasoning for advocating the literal construal of the language of science,

The common basis I assume is language in which reference is unproblematic to trees and mountains, people and books, to lightning and car crashes, as well as to the processes of aging, burning and flooding. To trust such discourse as our basis does not set it beyond critique[...] But in this, as elsewhere, we always start from where we are; we can’t step out of where we are into a presuppositionless discourse any more than into a view from nowhere. (van Fraassen [2003], 480).

For van Fraassen, we have no reason to deny the literal meaning of the language of science (at least the scientific language referring to observable entities). The literal construal of this scientific language is just as reasonable as the literal construal of our everyday language.

It is also important to understand that CE is not a form of global skepticism. Global skepticism is the view which results from a Humean regress that leads to solipsism where we can be sure of nothing but our immediate, phenomenal experience.<sup>3</sup> CE, as we’ve seen, is the view that science aims to give us theories which are empirically adequate. To believe a theory is empirically adequate is to affirm as true what it says of the observable phenomena it postulates: “[...] a theory is empirically adequate exactly if what it says about the observable things and events in this world, is true - exactly if it

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<sup>3</sup> There are some critics of CE who have accused CE of actually falling prey to Humean regress to global skepticism. I will not comment on whether I think this is true. On this point, I am only concerned with what van Fraassen takes himself to be committed.

saves the phenomena” (*Ibid.*, 12).<sup>4</sup> Consequently, CE is skeptical about unobservables, but this is *not* global skepticism. In his response to McMullin, van Fraassen writes that the skepticism that results from CE “is not anywhere near the sort of debilitating skepticism whose specter tends still to hover over traditional courses and anthologies in the theory of knowledge” (van Fraassen [2003], 486). It is this difference which separates CE from Humean global skepticism. Therefore, CE neither denies semantic independence nor does it endorse global skepticism; it is not a global anti-realist position.

This leads to some questions: how much does *not* being a global anti-realist make van Fraassen a realist? If it does, what sort of realist should we understand him to be? McMullin, as I have suggested, argues that CE is a realist position about O-theories where O-theories are those scientific theories which only postulate the existence of observable entities. Theoretically, this seems ok. I argue, however, that to whatever extent CE is a realist position about O-theories is entirely a matter of the convergence of empirical adequacy (van Fraassen’s sole criterion for the success of a theory) and the truth of the O-theory (McMullin and the scientific realists’ separate criterion for success). In other words, whatever realism van Fraassen could be said to have about O-theories has to do with a coincidence between their very separate criteria of success. Van Fraassen writes, “In the case of what McMullin calls O-theories, acceptance does involve belief that the theory is true, because for an O-theory truth and empirical adequacy coincide, by definition” (van Fraassen [2003], 482). This coincidence, I suggest, does not make van Fraassen the same kind of realist that McMullin is – and to see it as such would be a mistake. I return to this point in section (IV).

The precise nature and extent of van Fraassen’s realism is made clear by his conceptions of *truth* and *empirical adequacy*. Van Fraassen claims,

I insist in this context on a naïve pre-theoretical understanding of ‘true’ and ‘truth.’ A theory says that certain entities are real precisely if it implies statements to that effect. The entities in question are real precisely if those statements are true. Nor do I distinguish here between “there are X’s” and “X’s are real.” To say what is true is to say, of what is, that it is and, of what is not, that it is not – I add no metaphysical or

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<sup>4</sup> The meaning of the phrase “saves the phenomena” is itself a topic of debate between McMullin and van Fraassen in their dialogue. McMullin thinks it is committed to the truth and reality of the phenomena that is saved. I do not weigh in on this.

epistemological burdens to this venerable point. (van Fraassen [2003[, 482)

In this passage, van Fraassen makes explicit his commitment to an anti-metaphysical, non-epistemological, (almost) minimalistic notion of truth.<sup>5</sup> For CE, to accept a theory is to believe that it is empirically adequate; to believe that a theory is empirically adequate is to believe what it says about the observable entities it postulates. “With ‘empirically adequate’ understood in my terms, a theory which postulates only observable entities is true if it is empirically adequate” (*Ibid.*, 483). According to CE, this notion of empirical adequacy is the only evaluative measure of science. If a theory passes this measure, then (for the observable phenomena) it is true and the entities it postulates are real.

Is van Fraassen a realist about O-theories? Yes, but indirectly. We are entitled to this realism about O-theories only insofar as we are entitled to accept that they are empirically adequate. This is because, by sheer stipulation, an empirically adequate theory is true about observables. Given all of this, I find no serious reason to doubt that CE can be seen as (at least a kind of) a realist position about what McMullin calls O-theories. Therefore, I agree to allow premise (1) of my formulation of McMullin’s argument for van Fraassen’s unappreciated realism.

#### 4. Does Realism about O-theories Amount to *Scientific Realism*?

In section (II) of this paper, I formulated and gave evidence for the argument that McMullin makes for van Fraassen’s unappreciated realism. I have just (tentatively) allowed premise (1) of that argument. However, I now take issue with premise (2). More specifically, I argue that even if CE can be understood as a realist position about O-theories, this realism does not amount to *scientific realism* about much of the natural sciences. To reach this conclusion, I make two distinct but related claims: (1) it is not clear to me that the sciences listed by McMullin (concerning which van Fraassen is supposed to be a scientific realist) are entirely comprised of O-theories; and (2) even if they are, the coincidence of CE’s criteria of empirical adequacy with SR’s criteria of truth (or approximate truth) does not make their positions equivalent.

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<sup>5</sup> This notion of truth doesn’t seem far from the minimalist’s adage “snow is white is true iff snow is white.”

First, recall that for McMullin, O-theories are those theories that only postulate entities that are observable (in van Frassen's sense). If CE is accurately understood to be a realist position regarding these theories (as I've allowed), then CE ought to be understood to be realist about sciences that are exhaustively comprised of O-theories. As McMullin has it, this would qualify CE as *scientific realist* about many of the natural sciences. McMullin refers to some possible examples of these "natural sciences of the distant" as: astrophysics, geology, paleontology, archeology, physical anthropology and evolutionary biology. I examine a few of these sciences in order to shed some doubt on whether all of them qualify as exhaustively comprised of O-theories – and thereby, whether CE ought to be considered a scientific realist position about them.

Evolutionary biologists study (very roughly) how various forms of life came to exist over time. More particularly, this natural science concerns how various biological organism's physical characteristics have either increased or decreased their survival fitness throughout history. McMullin includes this science among the "natural sciences of the distant" because the entities it postulates (organism's ancestors) are distanced from us by time; they are historical. These historical entities (Cro-Magnon humans and Galapagos Island birds with various beak lengths) are certainly observable according to CE. I want to suggest, however, that built into evolutionary biology – inextricable from the science – is the postulation of genetic material. Genes are the very mechanism by which evolution takes place; they contain the blueprint of what form an organism takes, and mutation of these genes are what cause the variation that allows for survival competition. There is no evolutionary biology without genetic material, and genetic material is certainly unobservable by the naked senses of any human. If theories about genetic material are contained (in any part) of the science of evolutionary biology (as I've suggested they are) then it is not exhaustively comprised of O-theories. If evolutionary biology is not entirely comprised of O-theories, then CE cannot be a scientific realist position about it.

Perhaps what McMullin meant when he wrote, "constructive empiricism, as he [van Frassen] defines it, seems to involve a distinctively realist stance in regard to large parts of natural science," is that CE is only a realist position about the parts of the evolutionary biology that are observable. But that claim is hardly controversial because,

as we've seen, van Fraassen explicitly affirms a kind of realism about observables. Furthermore, realism about only *part* of a science is not scientific realism, as scientific realism is about all of science – or at least an entire science.

What about paleontology or astrophysics? Neither of these sciences seems to contain any reliance on genes, so maybe they could qualify as being entirely comprised of O-theories. Admittedly, I am no archeologist or astrophysicist, but it seems to me that a similar reliance on unobservables may be included somewhere in these sciences as well. Wouldn't paleontology (roughly described as the study of fossils) include fossils of microscopic organisms in its studies? Not every fossil is of a dinosaur. Don't current astrophysical theories rely (in some part) on theories of gravitational pulls and the speed of light? If so, then surely these are not observable. I phrase these issues in question form because I do not claim to have any expertise in these areas. I wish only to show that some of the natural science to which McMullin seems to attribute exhaustive O-theory content seems to me to have some reliance on U-theories. If this is the case, then it would seem that premise (2) of McMullin's argument for CE as a scientific realist position about much of the natural sciences is dubious.

At any rate, let's say that there are natural sciences that are comprised entirely of O-theories. On the face of it (perhaps) geology, archeology, and physical anthropology could count as this type of natural science. I argue that the existence of these sciences does not warrant CE to be considered a scientific realist stance (even with regard only to them). In order to argue for this, I claim (1) that scientific realism requires truth (or approximate truth) as a criterion for success, (2) CE only requires a success criterion of empirical adequacy, and (3) that the existence of natural science that satisfy both of these criteria does not make the two positions equivalent with regard to those sciences.

As for (1), I claim that scientific realism (in virtually all of its historical formulations) has among its tenets the view that the success of science ought to be measured by how close its theories come to correctly describing some kind of truth about the world. For example, Hilary Putnam writes that a realist holds (about a given scientific theory), "(1) the sentences of that theory are true or false; and (2) that what makes them true or false is something external[...]" (van Fraassen 8). Similarly, Richard Boyd writes (as the 2<sup>nd</sup> of his four central scientific realist theses), "Scientific theories,

interpreted realistically, are confirmable and in fact are often confirmed as approximately true by ordinary scientific evidence[...]" (Boyd, 41). Finally, Stathis Psillos defines scientific realism as including a metaphysical, semantic and epistemic stance, the last of which he defines as regarding "mature and predictively successful scientific theories as well-confirmed and approximately true of the world" (Psillos, xix). I mention these philosophers not to indicate all theorists who have ever identified themselves as scientific realists have had this commitment to a criterion of truth as the measure of the success of science. I only wish to indicate that scientific realism has a well-founded and firmly established connection to truth as a criterion for the success of science. So much so, I claim, that to refer to scientific realism is to imply that it has this criterion.

With regard to my second claim, I have already shown that CE is not committed to the truth of successful science. CE is a view of science in which it only aims at empirically adequate theories. To the extent that scientific theories are empirically adequate, we can say that what they postulate about the observable phenomena of a science is true – that it saves the phenomena. But this truth is *not* the criterion by which the success of the science is measured. Empirical adequacy is.

Even if CE is a kind of realist position regarding geology - to the extent that its scientific theories (might) only postulate phenomena that are observable, CE is still not a scientific realist about geology. The scientific realist claims that our theories about tectonic plates and the formation of the rocky mountain range are successful because they are true (or approximately true) about the world. The constructive empiricist claims these theories are successful because they are empirically adequate – where this success does not require reference to truth at all. Despite CE's being some kind of realist about the observable geological phenomena, and despite the (possible) exhaustive nature of observable phenomena with regard to geology, I argue CE is not a scientific realist about geology. Therefore, premise (2) in my formulation of McMullin's argument does not hold. If this is true, then the conclusion that CE is a scientific realist stance about much of the natural sciences is not sound.

## 5. Conclusion

McMullin's paper is far reaching in its analysis of constructive empiricism (CE). Despite its title, McMullin is not only concerned with showing that van Fraassen is a sort of (unappreciated) realist. His paper, in fact, criticizes many (if not all) aspects of constructive empiricism – right down to its central terms: *aim*, *acceptance*, *truth*, *belief*, and *empirically adequate*. In addition to his various terminological qualms with van Fraassen, however, McMullin is primarily concerned with the way in which van Fraassen engages with the scientific realism debate. SR, according to McMullin ought to be understood as being about ontology rather than epistemology. As McMullin sees it, the scientific realist, being the realist that he is, needs to say that a scientific theory commits its proponents to the *reality* of the entities it postulates; scientific realists are realists because they say that scientific theories tell us what entities we are supposed to think are *real* - not only what we are justified in believing. I find this point both interesting and (to some degree) convincing. Like McMullin, I am tempted to focus on and highlight the aspects of CE that are realist. However, unlike McMullin (as I have argued) I do not think this realism qualifies CE as any kind of *scientific realism*.

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